INDIA WEATHER REVIEW, 1967

ANNUAL SUMMARY

PART C

S T O R M S A N D D E P R E S S I O N S

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INDIA WEATHER REVIEW 1967

ANNUAL SUMMARY

PART-C

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STORMS & DEPRESSIONS

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DEPRESSIONS AND CYCLONIC STORMS :

During the year, five cyclonic storms and eight depressions formed in the Bay of Bengal and one cyclonic storm in the Arabian Sea. One depression from the Bay of Bengal moved into the Arabian Sea. One land depression also developed over the central parts of Bihar State. The tracks of the storms and depressions are given in fig. 1. The dates of activity of the storms and the greatest baromatric depths observed or estimated near their centres are summarised in the following Table I :

TABLE I

Locality	Month	Date	Greatest observed (or estimated) barometric depth.
Bay of Bengal	January	1st - 7th	20 mb
Bay of Bengal	May	15th - 18th	23 mb
Bay of Bengal	October	8th - 11th	30 mb
Arabian Sea	October	20th- 21st	14 mb
Bay of Bengal	October	20 th - 24th	27 mb
Bay of Bengal	December	4th - 8th	25 mb

The monthly distribution of the storms and depressions for the year is given in Table II at the end.

The detailed description of the systems are given below chronologically.

1. Cyclonic storm in the Bay of Bengal - 1st to 7th January.

A low pressure area formed over the southeast Bay of Bengal on 29th December 1966. The Bay Islands stations reported fairly widespread rain on this day. By the next morning, the low pressure area moved into the southwest Bay of Bengal. Broken to overcast cloudiness was extending over the south Bay as could be inferred from the satellite pictures. Rainfall was widespread over the south Bay Islands on

this day. On 31st morning, the low pressure area moved further west and by the same evening it became well marked. By the morning of 1st January 1967, it was lying over the extreme southwest Bay off Ceylon. Numbus-2, orbit 3075 reported overcast Cb, Ci at 1713 IST over this area. The low concentrated into a depression by the evening of 1st with centre near 8°N and 83.5°E. The following observations are of interest in this connection :

Date	Name of the ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direction	Speed knots	Pressure (mb)	Weather
1st	PFLJ	5.3	88.0	1730	SW	10	1007.1	Mainly overcast
1st	JRDV	5.9	89.6	1730	S	15	1006.5	Overcast
	VWPX	8.0	81.9	1730	N	15	1009.5	Mainly overcast
1st	Batticoloa	-	-	1730	WNW	5	1008.2	Rain
	Trincomalle	-	-	1730	NW	20	1008.4	Overcast
1st	Trincomalle	-	-	1730	N	25 at 300 m		
	Trincomalle	-	-	1730	N	30 at 600 m		
	Trincomalle	-	-	1730	N	30 at 900 m		

Moving in a northnortheasterly direction the depression intensified into a deep depression and was centred at 0830 hrs IST of 2nd near 9°N and 84°E. The following observations are significant in this connection.

Date	Name of the ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direction	Speed knots	Pressure (mb)	Weather
2nd	GNGH	12.5	81.7	0530	NE	30	1008.8	
	VWIS	13.5	82.3	0530	ENE	15	1009.6	
	Akash	9.7	81.2	0530	N	5	1011.7	
	GMSS	6.2	91.5	0530	S	10	1008.9	
	KODENIA	5.3	90.6	0530	SW	5	1008.2	
	Trincomalle	-	-	0830	NW	10	1010.3	Drizzle
	Batticoloa	-	-	0830	W	10	1010.8	Drizzle
	VWPS	13.6	83.3	1130	NE	15	1012.4	
	VWPX	10.6	81.9	1130	NNW	15	1013.5	
	PHKW	6.0	85.5	1130	W	10	1007.3	Showers
	JRDU	5.9	84.9	1130	W	20	1008.0	Showers
	Madras	-	-	0530	NNE NNE ENE	15 at 300 m 15 at 600 m 15 at 900 m		

Moving northeastwards, the deep depression was centred at 0830 IST of 3rd near 10.3°N and 85°E. Later it moved in an eastnortheasterly direction and was centred at 1730 IST of the same day near 10.5°N and 86.5°E. Ship VAVR at position 10.8°N and 85.4°E reported surface wind N/20 kt, pressure 1005.4 mb and showers at 1730 IST of 3rd. Till the next morning, it moved in a northnortheasterly direction and was centred at 0830 IST of 4th near 12.0°N and 87°E. There were a number of ships around the system, which reported surface wind of the order of 15 - 25 kt and drizzle and rain on the west, northwest and northern sides of the system at this time. Moving in a northnorthwesterly direction, the deep depression intensified into a cyclonic storm and was centred at 0830 IST of the 5th near 13°N and 86.5°E. The following observations are significant in this connection :

Date	Name of the ship/ station	Position		Time	Wind		Pressure (mb)	Weather
		Lat. °N	Long. °E	IST	Direction	Speed Knots		
5th	MCLD	11.8	84.5	0530	NNE	25	1008.2	Showers
	VWTL	12.0	84.0	0530	N	20	1006.3	
	VWLS	16.7	86.5	0530	NNE	30	1007.2	Drizzle
	VWLS	17.2	86.5	0830	NNE	30	1009.9	Rain
	VWRS	13.7	85.3	1130	NNE	30	1007.4	Rain
	ALMKERK	14.0	92.9	1130	SE	15	1009.9	

Nimbus - 3 Satellite pictures showed a Tropical Vortex near 13.5°N and 86.0°E at 1335 IST on the same day. Moving in a northwesterly direction, the cyclonic storm was centred near 13.5°N and 85.5°E on the morning of 6th. The storm then took a northnorthwesterly course and was centred at 0830 IST of 7th near 15.5°N and 84.5°E.

Ship Jagrahat at 16.2°N and 85.0°E reported wind SE/25 kt pressure 1006.0 mb and overcast sky at 0530 IST. Another ship at 16.1°N and 84.3°E reported at 0230 IST. surface wind NE/35 kt pressure 1005.9 mb and showers. The 24 hours pressure falls along Andhra - Orissa coasts were of the order of 2-3 mb and the pressure departures were -4 to -5 mb, along the Andhra coast at 0830 IST of 7th. Widespread rainfall was also reported from Orissa and the adjoining areas of Gangetic West Bengal. The storm moved northwards and had also started weakening rapidly. It lay as a depression centred at 1730 IST of 7th near 16.5°N and 84.5°E. The cyclonic circulation associated with the system extended upto 5.4 km only. Moving slightly northwards, the depression weakened into a low pressure area over west central Bay of Bengal by 8th and filled up next day.

Under the influence of this system, there was considerable influx of moisture into the northeastern parts of the Peninsula and northeast India leading to a spell of good rainfall there. Some of the noteworthy amounts of rainfall were : Long Island 10 cm on 2nd, Contai 8 cm on 7th and Calcutta (DUM DUM) 11 cm, Calcutta (Alipore) 10 cm Sagar Island 8 cm and Midnapore 7 cm on 8th.

The estimated lowest pressure during the life history of this system was 996 mb and the associated pressure defect was 20 mb.

2. Severe cyclonic storm in the Bay of Bengal 15th - 18th May.

A trough of low pressure appread over the southeast Bay of Bengal and the Bay Islands on the 13th. Widespread rain or thundershowers occurred over the Bay Islands on the 14th, under its influence. By the evening of 14th, a low pressure area formed over the southeast and adjoining east central Bay of Bengal. A cable received from U.S. Weather Bureau, Washington on this day read as follows : "ESSA - 3 photographs at 12.44 hrs IST - VORTEX 13°N, 91°E - Heavy clouds west and south of centre". The low pressure area concentrated into a depression by the morning of 15th with centre near 11.5°N and 91.5°E. The following observations are significant in this connection :

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
15th May	Indian Shipper	9.2	92.8	0530	SW	15	1004.2	Rain
	VWDG	9.6	91.1	0530	W	15	1005.5	Rain
	Port Blair	-	-	0830	SE	10	1002.2	Rain
	Car Nicobar	-	-	0830	Calm		1005.3	Rain
	Port Blair	-	-	0530	S	20	at 300 m	
				0530	SW	30	at 600 m	
				0530	SW	35	at 900 m	

The pressure departures over the Bay Islands area were of the order of -6 to -7 mb at this time. ESSA - 4 satellite pictures also showed a cyclonic circulation near 12.5°N and 90°E at 0945 IST of 15th with overcast area five degrees in diameter.

By the evening of 15th, the depression moved northwards and intensified into a deep depression with centre near 12.5°N and 91.5°E. In this connection, the negative pressure departure of 8.1 mb at Port Blair and 10.7 mb at Maya Bandar at 1730 IST of 15th are significant. Continuing to move in a northerly direction, the deep depression intensified into a cyclonic storm and was centred at 0830 IST of 16th near 13°N and 91.5°E. In this connection, the following observations are of interest.

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time	Wind Direction	Wind Speed	Pressure (mb)	Weather
16th May	Maya Bandar	-	-	0830	S	10	992.2	Rain
	Long Island	-	-	0830	W	5	994.9	Rain
	Port Blair	-	-	0830	SSW	30	996.5	Rain
	Coco Island	-	-	0830	S	10	995.9	Rain

The negative pressure departures at this time at Maya Bandar, Long Island and Port Blair were 15.6, 13.3 and 11.7 mb respectively. Nimbus 2 satellite orbit No. 4872 - reported at 1138 IST of 16th overcast cloud area 7° in diameter associated with the system, but no eye was visible. The storm moved slightly northnortheast, intensified into a severe cyclonic storm during the course of the night/was centred at

/and

0830 IST of 17th near 15°N and 92°E. ESSA-4 Satellite reported an overcast area about six degrees diameter with vortex near 15.5°N and 93°E at 1056 IST of 17th. Pressures were falling all along the Burma coast and the departures from normal there were of the order of -5 to -6 mb at this time. The winds at Port Blair at 0530 IST were SW/25 and SW/35 kt at 300 and 600 m respectively. Akyab reported wind ESE/35 kt at 300 m and SE/50 kt at 900 m and 1.5 km a.s.l. at the same time.

The severe cyclonic storm was centred near 16.5°N and 93°E at 1730 IST of 17th. Bassein reported surface wind SSE/25 kt, pressure 993.1 mb and rain, with a negative pressure departure of 11.5 mb at this time. Taking an almost northerly course and moving very rapidly, the severe cyclonic storm crossed the north Arakan coast between Akyab and Sandoway by the early morning of 18th and was centred at 0830 IST near 20°N and 94°E (about 80 km, westsouthwest of Minbu). Minbu reported surface wind SE/40 kt and pressure 993.2 mb at 0830 IST on this day. Nimbus 2 Satellite reported a vortex near 20°N and 95°E at 1030 IST on this date. The storm later weakened rapidly into a deep depression, moved northnortheastwards and was centred near 22°N and 94.5°E at 1730 IST of the same day. It later weakened into a low pressure area and moved away northnortheastwards.

Under the influence of this storm, the Bay branch of the monsoon advanced into the south Andaman Sea and the extreme south Bay of Bengal by the 13th. It also extended into the north Andaman Sea and the eastern parts of east central Bay during the next two days. Port Blair and Car Nicobar recorded 12 cm of rain each on 16th, Nancowry 13 cm on 16th and 9 cm on 17th, Long Island 7 cm on 16th and 9 cm on 17th and Bassein 15 cm on 18th.

The estimated lowest pressure during the life history of the storm was 982 mb and the corresponding pressure defect was about 23 mb.

3. Depression in the Bay of Bengal - 29th June :

A low pressure area formed over the west central and adjoining northwest Bay of Bengal on the morningof 28th. It became well marked by the evening of the same day and concentrated into a depression on the morning of 29th with centre near 20°N and 87°E. The circulation associated with the system extended upto 6.0 km a.s.l. Moving in a northwesterly direction, the depression crossed north Orissa coast near Chandbali by the evening and was centred at 1730 IST near Cuttack. Later it weakened into a well marked low pressure area which lay over northeast Orissa and adjoining Gangetic West Bengal and Bihar Plateau on the morning of the 30th. Later it moved slowly to northeast Madhya Pradesh and neighbourhood, where it became unimportant by the 4th.

Under the influence of this system, the monsoon was active in east Madhya Pradesh on 1st and 2nd July.

Some of the noteworthy amounts of rainfall associated with this depression were : Jagdalpur 8 cm on 29th, Cuttack 8 cm and Raipur and Janjgir 7 cm each on 30th, Umaria 10 cm and Pendra and Janjgir 8 cm each on 1st July, Pendra 8 cm on 2nd July and Balaghat 11 cm on 3rd July.

4. Deep depression in the Bay of Bengal - 26th to 29th July :

The eastern end of the monsoon trough was extending into the head Bay of Bengal on 23rd and a trough of low formed there on the morning of 24th. By the next morning it became a low pressure area. The low concentrated into a depression by 26th morning with centre at 0830 IST near 20.5°N and 88°E. The following observations are significant in this connection :

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
26th	Sandheads	-	-	0530	NE	20	992.1	Showers in the last hour
	Bhubaneswar	-	-	0530	WNW	5	994.2	Moderate continuous rain
	Sandheads	-	-	0830	ENE	15	992.6	
	Chandbali	-	-	0830	NNW	3	993.4	
	Calcutta	-	-	0830	NNE	10	994.6	Moderate continuous rain
	Khulna	-	-	0830	E	10	995.9	
	Cox's Bazar	-	-	0830	ESE	15	996.4	

The pressure departures over land areas adjoining the head Bay of Bengal were of the order of -6 to -8 mb. The upper air cyclonic circulation associated with the depression extended to 7.2 km a.s.l.

The depression moved in a westnorthwesterly direction and intensified into a deep depression by the evening when it was centred near 20.5°N and 87.5°E. Sandheads reported surface pressure of 988.7 mb at 1730 IST and the corresponding pressure defect was 9.7 mb. The easterlies just to the north and northeast of the deep depression were of the order of 20 to 35 kt upto above 6.0 km a.s.l. Continuing to move in a westnorthwesterly direction, the deep depression crossed the north Orissa coast between Balasore and Chandbali during the night and was centred at 0830 IST of 27th about 40 km east of Keonjargarh. Subsequently it rapidly moved towards westnorthwest and weakening into a depression at the same time, was centred at 0830 IST of 28th close to Seoni in west Madhya Pradesh. Later, moving in a northwesterly direction, it was centred on the morning of 29th about 50 km northnortheast of Ratlam in west Madhya Pradesh. By the same evening, it was centred near Erinpura Road in south Rajasthan. Thereafter, it weakened and merged into the seasonal low the next day.

Under the influence of this system, widespread rain occurred in Orissa, Gangetic West Bengal, Bihar Plateau and coastal Andhra Pradesh on the 27th. The monsoon was active in Madhya Pradesh on 28th and active to vigorous in west Madhya Pradesh and Gujarat State on 29th. Some of the noteworthy amounts of rainfall associated with this system were : Bolangir 11 cm and Bhubaneshwar 9 cm on 27th, Pachmarhi 10 cm, Akola 7 cm and Raipur 6 cm on 28th and Ahmedabad 32 cm, Baroda 16 cm, Bhuj 11 cm, Indore and Surat 9 cm each, Kandla (Kutch) 8 cm and Jalgaon, Porbandar and Jamnagar 7 cm each on 29th.

5. Deep depression in the Bay of Bengal - 31st July to 2nd August.

A low pressure wave was moving westwards across central Burma on the 29th July and emerged into the northwest Bay of Bengal on the 30th. Under its influence a low pressure area formed over the northwest Bay of Bengal with the associated upper air cyclonic circulation extending upto 6.0 km a.s.l. By the evening of the same day, it became well-marked and concentrated into a depression by morning of 31st with centre at 0830 IST near 19°N and 90°E. In this connection the following observations are significant :

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
31st	VWWP	15.6	92.6	0530	W	25	999.1	Overcast
	Sandheads	-	-	0830	ENE	25	994.9	
	Sagar Island	-	-	0830	ENE	15	995.0	
	Balasore	-	-	0830	ENE	10	995.4	
	Puri	-	-	0830	N	5	995.2	
	Sandoway	-	-	0830	SE	5	999.7	Rain
	Akyab	-	-	0830	E	10	997.2	
	AQLE	19.5	90.2	1130	E	5	994.9	
	VWDS	15.5	90.7	1130	WSW	30	998.1	Rain

Moving in a northwesterly direction, the system intensified into a deep depression and was centred near 20°N and 88.5°E at 1730 IST of 31st and by next morning near 20°N and 88°E. The upper winds at Calcutta were easterly 35 kt and easterly 40 kt at 600 m and 900 m respectively at 0530 IST of 1st. Moving in a westerly direction, the deep depression crossed Orissa coast near Paradeep during the night of 1st - 2nd and lay centred on the morning of 2nd near Bhubaneshwar. At this time, the cyclonic circulation associated with depression extended upto 7.2 km a.s.l. with a southward tilt. By the evening, the system weakened into a depression centred near Bolangir in Orissa. Later, it weakened into a low pressure area over north Orissa and adjoining east Madhya Pradesh and finally merged into the seasonal trough on the 4th.

Under the influence of the system, rainfall was generally widespread in Orissa, east Madhya Pradesh, Gangetic West Bengal and Bihar State on 1st. The monsoon was active in Orissa and Bihar Plateau on the 2nd. Widespread rain was reported from east Madhya Pradesh on the same day. The monsoon was vigorous in Vidarbha and active in west Madhya Pradesh on 3rd. The following are the significant amounts of rainfall associated with the system :- Kanker 10 cm, Umaria 7 cm, and Bhubaneshwar 4 cm on 1st; Daltonganj 7 cm, Phulbani and Chaibasa 6 cm each on 2nd and Buldhana 13 cm, Pachmarhi 1 cm, Hoshangabad and Kanker 9 cm each, Akola and Seoni 8 cm each, Gondia 7 cm and Narsingpur 6 cm on 3rd.

6. Depression in the Bay of Bengal - 18th to 19th August :

A cyclonic circulation between 3.0 and 4.5 km a.s.l. was moving westwards across central Burma on 14th August. On 15th evening, the circulation was extending between 2.1 and 6.0 km a.s.l. and the circulation was emerging into the north Bay of Bengal. Under its influence, a low pressure area formed over the north Bay of Bengal, on 16th morning. It became well marked on the morning of 17th with the associated upper air cyclonic circulation extending upto 6.0 km a.s.l. By 18th morning, the low pressure area concentrated into a depression with centre at 0830 IST near 21°N and 90°E. The pressure departures in the field of the depression were of the order of -6 to -7 mb at this time. Moving in a westnorthwesterly direction, the depression was centred near 21.5°N and 88.5°E at 0830 IST of 19th. Continuing to move in a westnorthwesterly direction, the depression crossed north Orissa-West Bengal coasts between Balasore and Contai by the afternoon and weakened into a low pressure area over north Orissa and adjoining Bihar Plateau. Moving westnorthwestwards, the low pressure area was lying over northeast Madhya Pradesh on 20th morning and later merged with the seasonal low over west Pakistan by the morning of 22nd.

Under the influence of this system, the monsoon was active in Orissa on 17th, in Gangetic West Bengal and east Madhya Pradesh on 18th, in Gangetic West Bengal on 19th and in BiharPlateau and east Madhya Pradesh on 20th.

Some of the noteworthy amounts of rainfall associated with the depression were: Sambalpur, Champa and Raigarh 7 cm on 17th, Contai 9 cm, Champa 8 cm, Jamshedpur 4 cm and Balasore and Narsingpur 3 cm each on 18th, Ambikapur 8 cm, Dhanbad 7 cm, Sidhi 6 cm, Jamui 5 cm and Sagar Island 4 cm on 19th and Raigarh 10 cm, Jabalpur 9 cm, Guna 7 cm, Tonk and Kanker 6 cm each and Narsingpur 5 cm on 20th.

7. Deep depression in the Bay of Bengal - 2nd to 7th September:

On the morning of 1st September, a feeble low pressure area formed over the north Bay of Bengal and associated upper air cyclonic circulation extended upto 2.1 km a.s.l. The pressure departures associated with the low were of the order of -3 to -4 mb at this time. By the same evening the low pressure area became well marked and the circulation extended upto 7.2 km a.s.l. It intensified into a depression by the next morning and was centred at0830 IST of 2ndnear 21.5°N and 89.5°E. The cyclonic circulation associated with the system extended upto 7.2 km a.s.l.

By the evening of the same day, the system intensified into a deep depression with centre at 1730 IST near 22°N and 88°E. The following observations are significant in this connection :-

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
2nd	Sagar Island	-	-	1730	SSW	45	993.5	Rain
	Sandheads	-	-	1730	SW	25	993.1	Drizzle
	Calcutta	-	-	1730	NE	Light	993.8	Thunderstorm

The pressure departures associated with the system were about -7 to -8 mb at this time. The cyclonic circulation associated with the system was extending upto 9.0 km a.s.l. Moving westnorthwestwards, the deep depression crossed West Bengal coast near Contai during the night of 2nd - 3rd and was centred close to Midnapore at 0830 IST of 3rd. Moving in a northwesterly direction, it was centred about 30 km south-southwest of Gaya on 4th morning. Later moving rapidly in a westnorthwesterly direction it was centred near Nowgong on 5th morning and about 40 km north of Kota on 6th morning. By the evening of 6th, the system weakened into a depression and the circulation associated with it extended upto 6.0 km a.s.l. only. By the7th morning, it was centred near Ajmer and later weakened into a low pressure area over West Rajasthan. It finally merged into the seasonal low by the 9th.

In association with this system, the monsoon was active to vigorous over most parts of north and central India. Some of the noteworthy amounts of rainfall recorded were: Shivpuri 13 cm on 2nd, Sagar Island 25 cm, Sandheads 22 cm and Balasore 16 cm on 3rd, Baripada 12 cm on 4th, Rewa 14 cm on 5th, Nimach 15 cm on 6th and Abu 19 cm on andErinpura Road 12 cm on 7th.

According to Press reports, serious floods were reported from Midnapore district of West Bengal, from Orissa, Bihar State, Uttar Pradesh, west Madhya Pradesh, Rajasthan and Haryana. The marooning of Barmer-Jodhpur Express train with about 500 passengers in it, between Tiwara and Balotra due to the flood water of the Luni river

on 8th and the submerging of roads in Madhya Pradesh due to the flood waters of the Narmada were some of the other havocs reported.

8. Land depression over Bihar State - 20th September

A low pressure area developed over the northwest and adjoining west central Bay of Bengal on the morning of 15th. It moved over to Bihar Plateau by the 16th and persisted there till 18th and on 19th morning it was lying over central parts of Bihar State. ESSA-2 satellite pictures indicated a cyclonic circulation near 25°N and 85.5°E with banding to the south and east on the morning of 19th. It concentrated into a depression by the morning of 20th with centre near 25.5°N and 85.5°E (about 50 km east of Patna). Patna reported surface pressure of 999.0 mb, surface wind NW/20 kt and heavy rain at 0830 IST on this day. The pressure deficiency at Patna at this time was 7 mb. ESSA-2 satellite pictures at 0914 IST showed an active cyclonic circulation near 26°N and Long. 87°E central overcast four degrees in diameter. Moving in a northerly direction it was centred near Darbhanga at 1730 IST of 20th. Without any further movement, the system weakened into a low pressure area the next morning and became unimportant by 22nd.

Under the influence of this depression, the monsoon was active in Gangetic West Bengal and Bihar State on 18th and in Bihar plains on 19th, 20th and 21st. Patna City recorded an exceptionally heavy fall of 36 cm of rain on 20th. The other noteworthy amounts of rainfall were: Ranchi, Dhanbad and Purnea 5 cm each on 18th, Patna Airport 14 cm, Darjeeling 9 cm, Malda 8 cm, Baghdogra 7 cm, Tura 6 cm and Jalpaiguri 5 cm on 19th, Patna AP 19 cm, Contai 11 cm, Jalpaiguri 10 cm, Baripada 7 cm and Cooch Behar 6 cm on 20th and Goalpara 7 cm, Patna City 6 cm, and Dhubri 5 cm on 21st.

The heavy rain in Patna was reported to have caused serious floods rendering thousands homeless and paralysing life in the city for a few days besides causing a few deaths. Damage to houses and crops due to floods were also reported from other parts of Bihar State.

9. Deep depression in the Bay of Bengal - 27th to 29th September.

A low pressure area formed over the northwest and adjoining west central Bay of Bengal on 25th morning. It moved slowly northwards and lay over north Bay the next morning, with the associated upper air cyclonic circulation extending to 6.0 km a.s.l. It concentrated into a depression by the morning of 27th with centre at 0830 IST near 20.5°N and 89.5°E. Moving in northwesterly direction, it intensified into a deep depression and was centred at 0830 IST of 28th near 21.5°N and 88.5°E. Sandheads reported surface wind W/30 kt pressure 999.7 mb and drizzle at 0830 IST of 28th. The pressure deficiency at Sandheads at this time was 8 mb. The upper air cyclonic circulation associated with the deep depression extended upto 6.0 km a.s.l. Crossing the West Bengal coast near Sagar Island the same evening and later recurving towards the northeast, it was centred about 50 km south of Dacca on the morning of 29th and near Agartala the same evening. A trough in the upper level westerlies between 7.2 and 10.5 km a.s.l. which was moving eastwards across Bihar State was perhaps responsible for the recurvature of the depression towards northeast. Continuing to move in a northeasterly direction, it weakened into a well-marked low pressure area on 30th over the central parts of Assam. It moved away northeastwards and became unimportant by the 1st October.

Under the influence of this system, the monsoon was active in Orissa on 27th. Rainfall was also fairly widespread in Gangetic West Bengal and Bihar Plateau on 27th and 28th. The monsoon was active in Gangetic West Bengal on 29th. Widespread rain also occurred in Assam on the same day.

Some of the noteworthy amounts of rainfall recorded during the period were: Bhubaneswar 16 cm and Chandbali 6 cm on 27th, Goalpara 7 cm and Bhubaneswar 6 cm on 28th and Sandheads 11 cm, Sagar Island 8 cm and Contai and Gauhati 4 cm each on 29th.

10. Micro-Cyclone of severe intensity in the Bay of Bengal - 8th to 11 th October

A low pressure area was lying over the Gulf of Siam on 5th morning. It moved into the north Andaman Sea by the 6th morning. Moving in a northwesterly direction, it lay over the east central Bay of Bengal on the morning of 7th. Continuing to move in the same direction it concentrated into a depression and was centred at 0830 IST of 8th near 18.5°N and 89°E. Ship VWJL at 19.5°N and 89°reported surface wind E/25 kt and pressure 1005.6 mb at 0830 IST on this day. There were no other ships to fix the centre of the depression. By the evening of 8th, the depression had become deep centred at 19.0°N and 87°E. ESSA-2 satellite pictures showed a cyclonic circulation near 19°N and 91°E at 0650 IST of 8th. By the morning of 9th, the depression had moved close to Orissa coast and intensified rapidly into a severe cyclonic storm of small extent (micro-cyclone). The 24 hours pressure changes along Orissa coast, however, were only of the order of -2 to -4 mb and the observed highest pressure departure of -3.6 mb was recorded at Puri at 0830 IST of this day. The severe cyclonic storm was centred at this time near Lat. 20°N and Long. 86°E. The available observations in the field of the storm are given below :

Date	Name of the ship/ station	Position		Time IST	Wind		Pressure (mb)	Weather
		Lat. °N	Long. °E		Direction	Speed knots		
9th	Gopalpur	-	-	0830	NW	5	1009.5	Overcast
	Puri	-	-	0830	Calm		1006.5	Drizzle
	Bhubaneswar	-	-	0830	NE	20	1007.4	Rain
	Cuttack	-	-	0830	ENE	10	1007.8	-
	Chandbali	-	-	0830	NE	2	1008.5	Drizzle
	Sandheads	-	-	0830	SSE	20	1009.9	Drizzle
	Bharatmitra	20.2	87.2	1030	SE	25	1005.5	Overcast
	GHRJ	19.5	88.2	1130	S	20	1008.0	Showers

ESSA-2 satellite-orbit 7452 at 0725 IST of 9th, reported a vortex near 20°N and 87°E with central overcast area 3° in diameter with banding all around. It moved at first in a northnorthwesterly direction for about 50 km after which it recurved eastnortheastwards and emerged into the Head Bay of Bengal close to Chandbali by about the midnight of 9th. According to the bulletin issued by U.S. Weather Bureau, Washington, the ESSA-3 photographs at 1257 IST on 9th October showed a vortex at 20°N and 86.5°E with diameter of central overcast two degrees and eye visible. Continuing to move eastnortheastwards, the severe cyclonic storm was centred at 0830 IST of 10th near 21°N and 88°E. Sandheads, which was stationed about 8 km south of Sagar Island, reported surface wind NE/20 kt, pressure 1003.6 mb and drizzle at 0830 IST of this day, Nimbus-2 satellite pictures at 1111 IST of 10th showed a cyclonic circulation near 21.5°N and 89°E. Sandheads also reported surface wind ENE/60 kt at 1130 IST on 10th. Moving in a northeasterly direction, the severe cyclonic storm crossed the east Pakistan coast during the night of 10 - 11th, rapidly weakened into a depression and was centred near Noakhali on the morning of 11th and about 60 km eastsoutheast of Agartala by the same evening. Weakening further, it moved away eastwards across Assam hills as a low pressure area by the 12th.

The cyclonic storm caused serious devastation over the coastal areas of Orissa on 9th. Extensive damage to life and property were reported in the newspapers. According to the report of the officer of the Department who toured the storm-affected areas, a stretch of about 120 km traversed by the storm, more or less parallel to the coast, was seriously affected over a belt of about 30 km width around the track. A large number of villages were destroyed and the damage to property ran into a few crores of rupees. About 1000 persons were reported to have lost their lives and about 50,000 heads of cattle perished. Inundation caused by tidal waves affected inland areas upto about 25 km, but it was only for a short duration.

According to the touring officer, the storm had a diameter of not more than 50 km. The storm passed between Paradeep and Cuttack and both these stations were not affected much and the maximum damage was caused in between these two places. The track of the storm over the land was about 120 km long and it took about 12-hours to travel this distance. According to this officer, the storm had a central eye of calm wind and it took half an hour for the eye to pass a place, which showed that the diameter of the eye was about 5 km only. The track of the storm passed through the following blocks in Cuttack district :-
1) Ersama, 2) Kujang, 3) Marsaghai, 4) Kendrapara, 5) Pattamundai and 6) Rajkanika, Marsaghai, Kujang and Kendrapara blocks suffered the maximum damages.

The maximum wind speed reached in association with this storm was estimated to be 150 kmph over Marsaghai block. From the satellite cloud information, the storm could be categorised as stage X Cat. 4, which gives a maximum wind of 157 kmph and central pressure 980 mb on 9th morning. The associated pressure defect would be about 30 mb.

Under the influence of this system, there was a spell of good rainfall over most parts of northeast India on 10th and 11th. Some of the noteworthy amounts of rainfall were: Sagar Island 25 cm, Silchar 10 cm, Contai 9 cm and Sandheads 5 cm on 10th and Alipore 6 cm, Agartala 4 cm and Kailashahr and Majbat 3 cm each on 11th.

11. Cyclonic storm in the Arabian Sea - 20th to 21st October.

On the evening of 18th, a low pressure area developed over the Comorin and neighbourhood. By the next morning it became well marked and the associated upper air cyclonic circulation extended upto 2.1 km a.s.l. By the same evening the circulation extended upto 5.4 km a.s.l. On the morning of 20th it had rapidly intensified into a cyclonic storm with centre at 0830 IST near 7°N and 79°E. The following observations are significant in this connection:

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
20th	Colombo	-	-	0830	SW	10	1008.9	Rain
	Puttalam	-	-	0830	SE	5	1011.6	Rain
	Kanyakumari	-	-	0830	NW	15	1010.6	Rain
	GVWP	7.7	79.1	1130	NE	37	1001.6	Rain
	GRKY	6.0	79.0	1130	WSW	33	1008.1	Rain
	Mannar	-	-	0530	E	15	at 300 m	
					E	20	at 600 m	
					E	20	at 900 m	

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
	Colombo	-	-	0530	WSW	10	at 300 m	
					WSW	10	at 600 m	
	Trivandrum	-	-	0530	NW	10	at 300 m	
					NW	15	at 600 m	
					NW	15	at 900 m	
					NNE	15	at 1500 m	

Nimbus 2 satellite reported a cyclonic circulation near 7.5°N and 79°E at 1238 IST of 20th with main clouding to the west. Widespread rainfall was reported from the extreme south Peninsula and Ceylon with a few heavy falls.

There were no ships in the vicinity of the storm during the evening. However, from the available observations, the storm could be centred near 7.5°N and 79.5°E at 1730 IST. Colombo reported westsouthwesterly winds 35 - 40 kt upto 2.1 km, SW/30 kt at 3.0 km and SSW/25 at 3.6 and 4.5 km a.s.l. respectively. The circulation associated with the storm extended upto 9.0 km a.s.l. at this time.

Even though thestorm lay so close to the west coast of Ceylon, the pressure deficiency at Colombo was only 2-3 mb at 1730 hrs IST of 20th suggesting that the storm was of very small extent. It moved eastwards, crossed the west coast of Ceylon between Puttalam andColombo during the course of the night, weakened into a depression and lay centred at 0830 IST of 21st near 7.5°N and80.5°E. The following observations were of interest in this connection.

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
21st	Puttalam	-	-	0830	ENE	10	1006.4	Rain
	Colombo	-	-	0830	NW	10	1007.5	Rain
	Hambantota	-	-	0830	SW	10	1008.2	Overcast
	Batticaloa	-	-	0830	S	5	1007.4	Overcast
	Trincomalee	-	-	0830	Calm		1007.9	Drizzle
	Mannar	-	-	0830	NNE	10	1008.0	Overcast
	Pamban	-	-	0830	N	35	1007.9	Overcast
	Hambantota	-	-	0530	W	30	at 300 m	
					W	35	at 600 m	
					WSW	35	at 900 m	

The highest pressure deficiency of 4.2 mb was recorded at Colombo at this time. Nimbus 2 satellite pictures showed a vortex near 7.5°N and 81°E at 1201 IST on the same day. The depression continued to move eastwards and was centred at 1730 IST of 21st near 7.5°N and 81.5°E. Later, it emerged into the southwest Bay of Bengal and weakened rapidly.

Under the influence of this storm, heavy to very heavy rain and squally winds were experienced in Comorin area, Gulf of Mannar, Ceylon and the extreme south Peninsula on 20, 21 and 22nd.

The following are some of the noteworthy amounts of rainfall associated with the storm :-

DATE	STATION	AMOUNTS (cm)
20th	Colombo	18
	Palayankottai	12
	Hambantota	9
21st	Tondi	18
	Ramanathapuram	13
	Atirampattinam	13
	Nagapattinam	9
	Jaffna	8
	Vedaranniyam	8
	Cuddalore	7
	Tuticorin	7
22nd	Trincomalee	15
	Mannar	11
	Puttalam	7

Press reports dated 21st October spoke of torrential rains and strong gales that had been lashing the west and southwest coast of Ceylon from 18th onwards. The rivers Kalu Kelam, Gim and Mahawel were rising. In Colombo itself 5000 people were rendered homeless. According to Press reports dated 24th October, the floods and gales have claimed 100 lives in Ceylon and rendered about 150,000 people homeless.

The storm is unique in two important respects, in that (i) no other storm or depression had originated in such a low latitude during October in the previous years and (ii) this is the first time a storm has moved eastwards at this latitude across Ceylon .

The estimated lowest pressure associated with this storm was 998 mb and the corresponding pressure deficiency was about 14 mb.

12. Severe cyclonic storm in the Bay of Bengal - 20th to 24th October

A low pressure area from the east moved into the south Andaman Sea on the 18th. It lay over the south Andaman Sea and adjoining southeast Bay on the next day and was well marked. According to cable received from U.S.Weather Bureau, Washington, ESSA-3 photographs 1143 IST of 19th showed a circulation centred near 8°N and 92°E with main cloudiness in south and west quadrants. The well-marked low pressure area concentrated into a depression on 20th with centre at 0830 IST near 9°N and 90.5°E. The following observations are significant in this connection :-

Date	Nameof the Ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direc-tion	Speed knots	Pressure (mb)	Weather
20th	VWRB	6.4	90.9	0530	WSW	20	1006.9	Rain
	GHMJ	5.8	87.1	0530	W	15	1009.0	Rain
	VWZX	9.1	83.1	0530	NE	15	1006.9	Squall
	AQLE	12.5	85.7	0530			1009.3	Mainly cloudy
	Car Nicobar	-	-	0830	SE	2	1007.2	Drizzle
	Port Blair	-	-	0830	ENE	10	1008.9	Mainly cloudy
	Kondul	-	-	0830	SW	5	1009.0	Rain
	Nancowry	-	-	0830	-	-	1009.3	Rain
	Port Blair	-	-	0530	E	30 kt at 300 m		
					E	30 kt at 600 m		
					E	30 kt at 900 m		
					E	35 kt at 1500 m		

As per Cable received from U.S. Weather Bureau, Washington, ESSA-3 photographs showed a vortex at Lat. 9.5°N and Long. 90°E at 1234 IST of 20th with heaviest clouds to west of centre, but considerable banding to east and south.

Moving in a northwesterly direction, it was centred near 10°N and 89.5°E at 0830 IST of 21st. ESSA-2 satellite reported a vortex near 9.5°N and 89.5°E at 0701 IST of 21st. Continuing to move in a northwesterly direction, the depression intensified into a deep depression and was centred at 1730 IST of 21st near 12°N and 89°E. There were no ships' observations available within five degrees of the centre of the system. However, bulletin from U.S. Weather Bureau, Washington, stated that ESSA photographs at 1325 IST 21st showed tropical vortex near 10.5°N and 89.5°E, and large Comma-shaped cloud mass with very broad trailing band extending from vortex to 83°E. The system had started moving in a northnorthwesterly direction from the evening of 21st and had also intensified further and lay as a cyclonic storm on the morning of 22nd with centre at 0830 IST near 13.5°N and 88°E. In this connection thefollowing observations are significant :-

Date	Name of the ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direc-tion	Speed knots	Pressure (mb)	Weather
22nd	VWZX	13.8	85.3	0530	N	13	1002.6	Cloudy
	GCWM	12.9	84.6	0530	NNW	12	1004.3	Overcast
	PGZZ	9.0	88.6	0730	SW	30	1009.1	Overcast
	SWGM	10.5	90.2	0730	SSW	45	1008.5	Overcast
	VWRX	16.8	86.2	1130	ENE	25	1005.9	Overcast
	Port Blair	-	-	0830	S	20	1008.1	Rain
	Port Blair	-	-	0530	SSE	25 kt at 300 m		
					SSE	30 kt at 600 m		
					S	35 kt at 900 m		
					SSW	30 kt at 1500 m		

∠ This, along with the isobaric gradient around the system, suggested that the same was a deep depression at this time.

ESSA-2 satellite photograph at 0737 IST of 22nd indicated a vortex near 13.5°N and 89°E (edge of picture). Even though there were no ships very near the system, ships as far away as 4° - 5° from the centre, reported winds ranging from 37-83 kmph indicating that the system was a cyclonic storm on 22nd morning. By the evening of the same day, the cyclonic storm was centred near 15°N, 88.5°E. Bulletin received from U.S.Weather Bureau, Washington, mentioned tropical vortex near 14.5°N and 89°E with bright band approximately 2 degrees wide extending from northeast quadrant and spirals all around central oval overcast. There were no ships very near the centre of the storm. From the evening of 22nd, the storm started recurving and moved in a northnortheasterly direction very rapidly. It lay centred at 0830 IST of 23rd near 19°N, 90.5°E as a severe cyclonic storm. Akyab reported surface wind ESE/35 kt, pressure 1001.6 mb and rain at 0830 IST. The pressure defect at Akyab at this time was 11.0 mb. Rangoon reported easterly wind 25 kt at 300 m, ESE/50 kt at 600 m, SE/35 kt at 900 m and S/15 kt at1500 m a.s.l. at 0530 IST. ESSA-2 satellite at 0619 IST of 23rd showed vortex near 18°N and 91.5°E eye clearly visible with tight bands all sectors central overcast of three degree in diameter - inner bands were also visible. Bulletin from U.S.Weather Bureau, Washington, stated that ESSA-3 photographs at 1121 IST showed vortex at 20°N and 91°E, diameter of central overcast four degrees, heavy banding and Ci outflow to northeast. Continuing to move in a northnortheasterly direction, the severe cyclonic storm crossed the east Pakistan - Arakan coast between Cox's bazar and Akyab on the evening of 23rd and weakened into a cyclonic storm. It lay with centre near 22°N, 93°E at 1730 IST of 23rd. Weakening further into a depression and moving in a northeasterly direction, it lay on the morning of 24th, over Burma with centre at 0830 IST about 120 km northwest of Monywa and later moved away northeastwards after weakening further.

As per the paper by Htay Aung entitled "severe cyclonic storm responsible for flash flood in Pokokku and Monywa districts during the month of October 1967" published in the Proceedings of a joint Training Seminar held by RA II and V of the WMO, at Kualalumpur, Malayasia from 11 -23 November 1968 on Forecasting of heavy rains and floods", the maximum observed wind was 90 mph at 1230 IST on 23rd from a southeasterly direction. Except for automatic instruments, all the observations were abandoned at Akyab after 1230 IST due to very strong winds. Thelowest pressure reached at Akyab on 23rd was 986 mb at 1400 IST as determined from the barogram of this station.

Based on the satellite picture of 23rd morning, the maximum wind associated with the storm is estimated to about 148 kmph. The lowest pressure associated with the storm was about 986 mb and the corresponding pressure defect works out to be about 27 mb.

This system caused widespread rain in the Bay Islands with scattered heavy falls in the south Bay Islands on 21st. Nancowry, Kondul and Car Nicobar reported 11.8 and 6 cm of rain respectively on this day.

Due to the heavy rains which occurred on 23rd and 24th October, flash floods occurred in the Pakokku and Monywa districts of central Burma. The townships that suffered most were Yinmabin, Seikpyu, Pekokku, Pauk and Gangaw. The flash flood washed away thousands of houses, and about 200 lives and more than 1000 heads of cattle were lost. Due to inundation, serious failure of crop occurred in Sagaing and Magwa divisions.

13. Depression in the Bay of Bengal - 31st October to 2nd November.

A low pressure area from the east moved into the south Andaman Sea on the 28th. It moved into the southwest Bay of Bengal on the 29th and concentrated into a depression on the morning of 31st with centre at 0830 IST near 10°N and 85°E. ESSA-2 satellite reported at 0719 IST of 31st, a vortex near 10°N and 85°E with bands in all sectors and central overcast area two degrees in diameter. Moving in a westnorthwesterly direction, it lay centred at 0830 IST of 1st November near 11.5°N, 82.5°E. Continuing

to move westnorthwestwards, the depression intensified into a deep depression and was centred at 1730 IST near 12°N and 81°E. The following observations are relevant in this connection.

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
1st	MYBX	12.7	82.5	1730	ESE	20		Showers
	Madras	-	-	1730	E	5	1009.4	Rain
	Cuddalore	-	-	1730	NW	5	1007.0	Overcast
	Madras	-	-	1730	NE	20 kt at 300 m		
					E	25 kt at 600 m		
					E	30 kt at 900 m		
					E	30 kt at 1500 m		
	Nagapattinam	-	-	1730	N	5 kt at 300 m		
					NNW	5 kt at 600 m		
					NNW	10 kt at 900 m		
					NW	10 kt at 1500 m		

Bulletin from U.S.Weather Bureau, Washington, mentioned that ESSA-3 satellite pictures at 1306 IST of 1st showed a vortex near 12°N and 81°E, diameter of overcast area about four degrees with bandings to the south and cirrus outflow in the north quadrant.

Moving in a westerly direction, the deep depression crossed the north Madras coast near Cuddalore in the early morning of 2nd and weakened into a depression. It lay centred at 0830 IST of 2nd near Kallakurichi. Later weakening into a low pressure area, it moved westwards, emerged into the southeast Arabian Sea off Kerala coast by 3rd morning. Thereafter, it moved slowly westwards and moved across southwest Arabian Sea by the sixth.

Under the influence of this system, fairly widespread rainfall occurred in Madras State on 1st, 2nd, 3rd and 4th. Cuddalore recorded exceptionally heavy rain of 20 cm on 2nd and 32 cm on 4th. The other noteworthy amounts of rainfall were:

Date	Station	Amounts (cm)
1st	Madras	5
2nd	Nellore	10
	Tiruchchirappalli	5
	Vedaranniyam	5
3rd	Salem	16
	Nellore	8
	Kallakurichi	8
	Vedaranniyam	5
	Pamban	5
	Cuddalore	4
4th	Coonoor	10

14. Depression in the Bay of Bengal - 27th to 29th November

A low pressure area was lying over the extreme south Andaman Sea on the evening of 24th. It moved westwards and was lying over the southeast and adjoining southwest Bay of Bengal on 25th morning. ESSA-2 satellite pictures showed a feeble cyclonic circulation near about 7°N and 88°E at 0902 IST of 25th. On 26th morning, it was lying over the southwest Bay of Bengal and was well-marked. The 24 hour pressure falls over Ceylon and the southern parts of Madras State were above 2 mb at this time. The low pressure area concentrated into a depression by the morning of 27th with centre at 0830 IST near 6°N and 84.5°E. Moving in a westerly direction, the depression was centred near 6°N and 83.5°E at 1730 IST of the same day. Moving in a southwesterly direction and intensifying into a deep depression, it was centred near 5.5°N and 82.5°E at 0830 IST of 28th. The following observations are of interest in this connection :

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
28th	FOEH	5.9	81.8	0530	NNE	30	1005.5	Overcast
	VWCK	7.1	82.0	1130	E	10	1008.8	Drizzle
	GKNY	6.0	83.6	1130	S	5	1010.2	Showers

The deep depression later moved in a westerly direction and was located near 5.5°N and 79.5°E at 0830 IST of 29th. It had probably weakened into a depression by this time. ESSA-2 satellite pictures at 0738 IST of 29th showed a vortex near 7°N and 77°E with a small overcast of Cu and Cb banding to west and south. Moving westwards, it weakened into a low pressure area over the Comorin area by the same evening. It moved away further westwards across Maldive area by the 4th December.

Ceylon experienced good rainfall activity on 28th and 29th and the extreme southern parts of Madras State experienced light to moderate rainfall on 29th under the influence of this depression.

15. Severe cyclonic storm in the Bay of Bengal - 4th to 8th December

A low pressure area was moving westwards across the Malayan Peninsula and adjoining south Burma on the 28th. It emerged into the south Andaman Sea on the 29th. Nimbus-2 satellite reported a cyclonic circulation near 6°N and 94°E at 1130 IST of 29th with bands in north and west. By 30th, it moved westwards and lay over the extreme southeast Bay of Bengal and adjoining south Andaman Sea and was well-marked. On the morning of 1st December it lay over the extreme southeast Bay of Bengal. It was persisting more or less over the same area till 3rd. A number of ships near 6°N and between 84°E and 95°E, reported heavy clouding with rain on this day. It concentrated into a depression on 4th, with centre at 0830 IST near Lat. 4.5°N and 88.5°E. Moving rapidly in a westnorthwesterly direction, it was centred at 1730 IST of 4th near 6°N and 85°E. Cable received from U.S.Weather Bureau, Washington, stated that ESSA-2 photographs at 1209 IST of 4th showed tropical vortex near 7°N and 83°E, bright circular cloud mass with breaks approximately 8 degrees in diameter and Cirrus outflow in all quadrants. Moving in a northwesterly direction, it intensified into a deep depression, with centre at 0830 IST of 5th near 7.5°N and 83.5°E. The following observations are of interest in this connection :

Date	Name of the ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direction	Speed	Pressure (mb)	Weather
5th	PEUC	3.5	88.0	0530	WSW	14	1007.2	
	MYCK	13.5	84.2	0530	NE	18	1008.9	
	VRPN	6.0	84.7	0530	SW	6	1005.0	Showers
	Colombo	-	-	0830	NNE	5	1009.9	
	Batticaloa	-	-	0830	NW	15	1008.4	Mod. continuous rain
	Hambantota	-	-	0830	NW	5	1008.1	
	Trincomalee	-	-	0830	N	10	1008.6	Rain
	UUKK	5.8	82.8	1130	W	10	1007.5	Mainly cloudy

ESSA-6 satellite at 0933 IST of 5th reported a vortex near 8°N and 82°E. All stations along the Madras coast were reporting heavy clouding and rain at this time. The deep depression moved in a westnorthwesterly direction and intensified into a cyclonic storm by the evening. It was centred at 1730 IST of 5th near 7.5°N and 82.5°E. Surface winds at Jaffna, Trincomalee and Batticaloa had by now strengthened and they were N/15 kt, NNW/20 kt and NW/15 kt respectively at 1730 IST. Upper winds along Madras coast had also considerably strengthened by the same time. There was a good fall of surface pressure along the eastern coast of Ceylon and the largest fall of 4.1 mb was recorded at Batticaloa at 1730 IST. Bulletin received from U.S.Weather Bureau, Washington reads as follows: "ESSA-3 photographs at 1300 IST of 5th showed tropical vortex near 7°N and 83°E with large Comma-shaped cloud mass extending to north and east. Cloud mass is approximately 6 degrees in diameter at southern end and near vortex. Cirrus outflow all quadrants and strong external banding to south". The cyclonic storm crossed the east coast of Ceylon near Batticaloa during the early morning of 6th and was centred at 0830 IST of that day about 40 km westsouthwest of Batticaloa. ESSA-2 satellite pictures at 0751 IST of 6th showed tropical vortex near Lat. 9°N and Long. 81°E with the central overcast area about six degrees in diameter and heavy clouding to northeast with heavy Ci bands in all sectors. Moving in northnorthwesterly direction, it further intensified into a severe cyclonic storm and was centred at 0830 IST on 7th near Jaffna. The following observations are noteworthy in this connection :

Date	Name of the ship/ station	Position Lat. °N	Long. °E	Time IST	Wind Direction	Speed knots	Pressure (mb)	Weather
7th	Pamban	-		0830	NW	58	1003.7	Rain
	Pondi	-		0830	NW	20	1005.9	Rain
	Vedaranniyam	-		0830	N	35	1004.2	Rain
	Nagapattinam	-		0830	NNE	25	1004.9	Rain
	Cuddalore	-		0830	NE	20	1009.4	Rain
	Trincomalee	-		0830	SW	10	1003.4	Drizzle

Date	Name of the ship/ station	Position Lat. °N	Position Long. °E	Time IST	Wind Direction	Wind Speed knots	Pressure (mb)	Weather
	Hambantota	-		0530	W	30 kt at 300 m		
					W	40 kt at 600 m		
					W	40 kt at 900 m		
					W	35 kt at 1500 m		
	Madras	-		0530	NNE	10 kt at 300 m		
					NNE	25 kt at 600 m		
					NNE	25 kt at 900 m		
					NE	25 kt at 1500 m		

The largest pressure deficiency of 9.4 mb was recorded at Pamban at 0830 IST of this day. ESSA-2 satellite photographs at 0647 IST of 7th showed tropical vortex near 8.5°N and 80°E with central overcast six degrees eastwest with heavy cirrus canopy and bands all quadrants. The cloud mass was extending to north and no northeast. The inner bands were also seen, but eye was not visible. With the available upper air observations, it could be inferred that the circulation associated with the storm was probably extending at least upto 10.5 km a.s.l.

Taking a northerly course, the severe cyclonic storm crossed Madras coast near Nagapattinam in the early morning of 8th, weakened into a cyclonic storm and was centred at 0830 IST about 40 km southwest of Cuddalore. Later, moving westwards and weakening at the same time, it lay as a depression at 1730 IST with centre about 30 km, westsouthwest of Salem. Weakening into a low pressure area and continuing to move westwards it emerged into the southeast Arabian sea and lay off north Kerala - Mysore coasts on the 9th morning. It later moved away further westwards across the east central Arabian Sea by the 13th.

The storm was at its highest intensity on the 7th. From the available satellite cloud information, it could be categorised as Stage X, Category 2, diameter 6 degrees. This gives a maximum wind of 70 kt associated with the storm and a central pressure of 988 mb at 0830 IST of 7th. The associated pressure defect is of the order of 25 mb.

Under the influence of this storm, squally winds and gales lashed the Madras coast between Pamban and Cuddalore on 6th and 7th and heavy to very heavy rains occurred in Madras State from 4th to 9th. Vedaranniyam recorded an exceptionally heavy fall of 29 cm of rain on 7th and 15 cm on 8th and 14 cm on 9th. The other noteworthy amounts of rainfall reported were : Nagapattinam 10 cm on 4th, 17 cm on 7th and 15 cm on 8th, Atirampattinam 14 cm each on 7th and 8th, Tondi 12 cm on 7th and 15 cm on 8th, Pamban 10 cm on 7th and 12 cm on 8th, Tiruchchirappalli 10 cm on 8th and 13 cm on 9th.

According to Press reports, Rameswaram Island was cut off from the mainland due to gales and heavy rain caused by the storm. Road and rail communications were also seriously disrupted particularly in the southern districts of Madras State due to heavy rains in addition to the severe havoc caused in the coastal areas of Ramanathapuram and Tanjavur districts due to gales and inundation by tidal waters. The storm was reported to have taken a toll seven lives and rendered about 15,000 people homeless.

TABLE II

Monthly distribution of storms and depressions in the Bay of Bengal and Arabian Sea - 1967.

Month	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Total	
Disturbance	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C
Bay of Bengal	-	1	-	-	-	-	-	-	-	1(1)	1	-	2	-	1	-	2	-	1	2(2)	1	-	-	1(1)	8	5(4)
Arabian Sea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	1
Land depression	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-
Total	-	1	-	-	-	-	-	-	-	1(1)	1	-	2	-	1	-	3	-	1	3(2)	2	-	-	1(1)	10	6(4)

D = Depression; C = Cyclonic Storm

Figures in brackets indicate severe cyclonic storm.

TRACKS OF STORMS AND DEPRESSIONS

(IN THE INDIAN SEAS)

1967

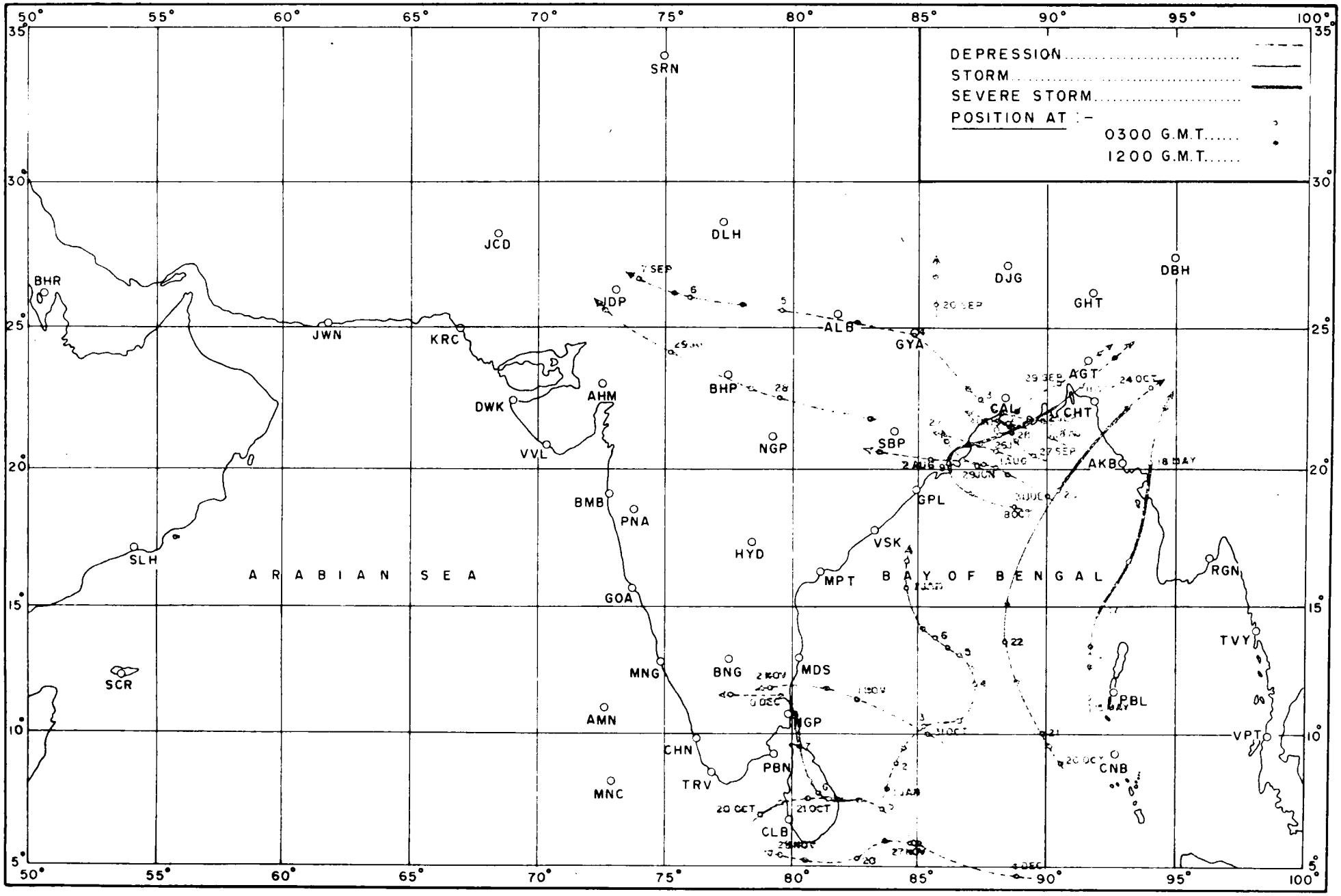

FIG. 1